

**IN THE CLAIMS:**

1. (Currently Amended) A breathing assistance apparatus adapted to deliver humidified ~~gases~~ gas at a desired level of humidity or at a desired temperature to a patient using open loop control comprising:

~~humidification means~~ a humidifier having an electrical input power and capable of humidifying said ~~gases~~ gas up to a level of humidity prior to delivery to said patient, said level of humidity depending on said input power to said ~~humidification means~~ humidifier, ~~transportation pathway means for conveying said humidified gases from said humidification means to said patient; and~~

~~control means~~ a controller or processor including stored instructions configured or programmed to:

(a) determine a parameter relating to the flow rate of said ~~gases~~ gas through said apparatus;

(b) determine based on at least said parameter the required electrical power input to said ~~humidification means~~ humidifier to deliver said ~~gases~~ gas to said patient at a level of humidity or at a temperature substantially similar to said desired level of humidity or said desired temperature;

(c) supply as said input power to said ~~humidification means~~ humidifier a level of power substantially similar to said determined power input to said ~~humidification means~~ humidifier;

(d) continuously monitor said parameter ~~or said variable~~, and when a change in said parameter ~~or said variable~~ is greater than a first threshold, indicating a change in the flow

rate of said ~~gases~~ gas, said ~~control means~~ controller or processor reverts to said instruction (a).

2. (Currently Amended) A breathing assistance apparatus as claimed in claim 1 wherein when a change in said parameter ~~or said variable~~ is greater than a second threshold indicating said ~~control means~~ controller or processor reverts to instruction (b), said second threshold relating to a lesser change in the flow rate than said first threshold.

3. (Currently Amended) A breathing assistance apparatus as claimed in claims 1 or 2 wherein said breathing assistance apparatus further comprises:

*B3*  
a conduit configured to convey said humidified gas from said humidifier to a patient  
~~pathway heating means~~ a conduit heater having an electrical input power, and being associated with said ~~transportation pathway means~~ conduit wherein the ~~gases~~ gas flowing through said ~~transportation pathway means~~ conduit are heated either directly or indirectly by said ~~pathway heating means~~ conduit heater whereby the level of heating depending on said input power to said ~~pathway heating means~~ conduit heater;

an ambient temperature sensor providing an indication of the exterior temperature or said controller or processor storing an assumption of the exterior temperature used as an indication of the exterior temperature; and said instruction (b) further comprises determining based on at least said indication of the exterior temperature the required power input to said ~~pathway heating means~~ conduit heater to deliver said ~~gases~~ gas to said patient at a level of humidity or at a temperature substantially similar to said desired level of humidity or said desired temperature;

and said instruction (c) further comprises supplying as said input power to said ~~pathway heating means~~ conduit heater a level of power substantially similar to said determined power input to said ~~pathway heating means~~ conduit heater.

4. (Currently Amended) A breathing assistance apparatus as claimed in ~~any one of claims 1 to claim~~ claim 3 wherein said first threshold relates to the rate of change of said parameter ~~or said variable~~ with respect to time, wherein when said rate of change is greater than said first threshold said ~~control means~~ controller or processor reverts to said instruction (a).


BB 5. (Currently Amended) A breathing assistance apparatus as claimed in ~~any one of claims 1 to claim~~ claim 4 wherein said rate of change or said change in said parameter ~~of said variable~~ indicates a decrease in flow said ~~control means~~ controller or processor pauses for a first delay before said ~~control means~~ controller or processor reverts to said instruction (a) and if said rate of change or said change indicates an increase in flow said ~~control means~~ controller or processor pauses for a second delay before said ~~control means~~ controller or processor reverts to said instruction (a), said second delay being longer than said first delay.

6. (Currently Amended) A breathing assistance apparatus as claimed in claim 3 wherein said ~~control means~~ controller or processor monitors said input power supplied to said ~~pathway heating means~~ conduit heater to provide an indication of the resistance or temperature of said ~~pathway heating means~~ conduit heater.

7. (Currently Amended) A breathing assistance apparatus as claimed in ~~any one of claims 1 to claim~~ claim 6 wherein said indication of the temperature or resistance is used by said

~~control means~~ controller or processor at least in said instruction (d) as said parameter relating to the flow rate of said ~~gases~~ gas.

8. (Currently Amended) A breathing assistance apparatus as claimed in claim 7 wherein said input power to said ~~pathway heating means~~ conduit heater comprises a voltage signal and a current signal, and said indication of the temperature or resistance relates at least in part to said voltage signal and/or said current signal and said input power to said ~~pathway heating~~ means conduit heater.

 9. (Currently Amended) A breathing assistance apparatus as claimed in claim 8 wherein said ~~humidification means~~ humidifier comprises a humidification chamber adapted to receive a volume of water and ~~water heating means~~ water heater to heat said water to produce water vapour within said chamber in use, said ~~gases~~ gas passing through said water vapour in said chamber thereby being humidified, said instruction (a) further comprising:


i) energising said ~~water heating means~~ water heater to heat said water towards a first condition,

ii) continuously monitoring said parameter or a variable indicative of a property of said ~~water heating means~~ water heater, until said variable or said parameter indicates that said water has substantially reached said first condition,

iii) determining said parameter based on at least said variable and said indication of the external temperature.

10. (Currently Amended) A breathing assistance apparatus as claimed in claim 3 wherein the determination of said power to said ~~humidification means~~ humidifier in said instruction (b) is also based on said indication of the external temperature.

11. (Currently Amended) A breathing assistance apparatus as claimed in ~~any one of claims claim 1 to 10~~ wherein said breathing assistance apparatus further comprises a gases gas supply means adapted to supply gases gas to said ~~humidification means~~ humidifier at a required pressure and resulting flow rate.

 12. (Currently Amended) A breathing assistance apparatus as claimed in claim 11 wherein said ~~gases gas~~ supply ~~means~~ provides an output signal representative the level of electrical output to said ~~gases gas~~ supply ~~means~~, said signal being supplied to said ~~control means~~ controller or processor from which the flow rate of said humidified gases gas is determined.

13. (Currently Amended) A breathing assistance apparatus as claimed in ~~claims 11 or claim 12~~ wherein said ~~gases gas~~ supply ~~means~~ comprise a fan driven by a variable speed electric motor.

14. (Currently Amended) A breathing assistance apparatus as claimed in ~~any one of claims 11 to claim 13~~ wherein said ~~estimate of the flow rate of said humidified gases~~ parameter is based on the current drawn by said variable speed motor.

15. (Currently Amended) A breathing assistance apparatus as claimed in ~~any one of~~

claims claim 1 to 14 wherein said breathing assistance apparatus further comprises a ~~gases~~  
~~gas~~ flow rate sensor from which said ~~estimate of the flow rate of said humidified gases~~  
parameter is determined directly.

16. (Currently Amended) A breathing assistance apparatus as claimed in claim 9 wherein  
said ~~humidification means~~ humidifier further comprises:

a chamber ~~sensing means~~ sensor providing an indication of the temperature of said  
~~water heating means~~ water heater and providing an indication of the electrical power drawn  
by said ~~water heating means~~ water heater,

BB wherein said variable is indicative of said indicator of the temperature of said ~~water~~  
~~heating means~~ water heater or said indication of the power drawn by said ~~water heating~~  
~~means~~ water heater.

17. (Currently Amended) A breathing assistance apparatus as claimed in claim 16  
wherein said parameter at least in said instructions (a), (b) and (c) is defined as the value of  
said power drawn by said ~~water heating means~~ water heater divided by said temperature of  
said ~~water heating means~~ water heater.

18. (Cancelled)

19. (New) A method of delivering humidified gas at a desired level of humidity or at a  
desired temperature to a patient using an open loop controlled humidifier comprising the  
steps of:

(a) determining a parameter relating to the flow rate of said gas through said

humidifier;

(b) determining based on at least said parameter the required electrical power to said humidifier to deliver said gas to said patient at a level of humidity or at a temperature substantially similar to said desired level of humidity or said desired temperature;

(c) supplying a level of power to said humidifier substantially similar to said determined power;

(d) continuously monitoring said parameter, and when a change in said parameter is greater than a first threshold, indicating a change in the flow rate of said gas, revert to step (a).

B2 20. (New) A method as claimed in claim 19 wherein step (d) further comprising: when a change in said parameter is greater than a second threshold indicating said controller or processor reverts to instruction (b), said second threshold relating to a lesser change in the flow rate than said first threshold.

21. (New) A method as claimed in claims 19 or 20 further comprising the steps:  
conveying said humidified gas to a patient  
heating the conveyed gas either directly or indirectly using a conduit heater;  
sensing or making an assumption of the exterior temperature;  
and said instruction (b) further comprises determining based on at least said indication of the exterior temperature the required power input to said conduit heater to deliver said gas to said patient at a level of humidity or at a temperature substantially similar to said desired level of humidity or said desired temperature;  
and said instruction (c) further comprises supplying as said input power to said

conduit heater a level of power substantially similar to said determined power input to said conduit heater.

22. (New) A method as claimed in claim 21 wherein said first threshold relates to the rate of change of said parameter with respect to time, wherein when said rate of change is greater than said first threshold said controller or processor reverts to said instruction (a).

23. (New) A method as claimed in claim 22 wherein said rate of change or said change in said parameter indicates a decrease in flow said controller or processor pauses for a first delay before said controller or processor reverts to step (a) and if said rate of change or said change indicates an increase in flow said controller or processor pauses for a second delay before said controller or processor reverts to step (a), said second delay being longer than said first delay.

24. (New) A method as claimed in claim 21 further comprising the step of monitoring the input power supplied to said conduit heater to provide an indication of the resistance or temperature of said conduit heater.

25. (New) A method as claimed in claim 24 wherein said indication of the temperature or resistance is used at least in step (d) as said parameter relating to the flow rate of said gas.

26. (New) A method as claimed in claim 25 wherein said input power to said conduit heater comprises a voltage signal and a current signal, and said indication of the temperature or resistance relates at least in part to said voltage signal and/or said current signal and said



input power to said conduit heater.

27. (New) A method as claimed in claim 26 wherein said humidifier comprises a humidification chamber adapted to receive a volume of water and water heater to heat said water to produce water vapour within said chamber in use, said gas passing through said water vapour in said chamber thereby being humidified, said instruction (a) further comprising:

- i) energising said water heater to heat said water towards a first condition,
- ii) continuously monitoring said parameter or a variable indicative of a property of said water heater, until said variable or said parameter indicates that said water has substantially reached said first condition,
- iii) determining said parameter based on at least said variable and said indication of the external temperature.

28. (New) A method as claimed in claim 21 wherein the determination of said power to said humidifier in said instruction (b) is also based on said indication of the external temperature.

29. (New) A method as claimed in claim 19 further comprising the step of supplying gas to said humidifier at a required pressure and resulting flow rate.

30. (New) A method as claimed in claim 29 further comprising the step of determining the level of electrical power required to supply said gas at a required pressure and resulting flow rate, from which the flow rate of said humidified gas is determined.

31. (New) A method as claimed in claim 29 wherein said gas is supplied by a fan driven by a variable speed electric motor.

32. (New) A method as claimed in claim 31 wherein said parameter is based on the current drawn by said variable speed motor.

33. (New) A method as claimed in claim 19 wherein said parameter is determined directly from a gas flow rate sensor.

34. (New) A method as claimed in claim 27 further comprising the step of:  
sensing the temperature of said water heater and providing an indication of the electrical power drawn by said water heater,  
wherein said variable is indicative of the temperature of said water heater or said indication of the power drawn by said water heater.

35. (New) A method as claimed in claim 27 further comprising the step of:  
sensing the temperature of said water heater and providing an indication of the electrical power drawn by said water heater,  
wherein said variable is indicative of the temperature of said water heater or said indication of the power drawn by said water heater.

36. (New) A breathing assistance apparatus adapted to deliver humidified gas at a desired level of humidity or at a desired temperature to a patient using open loop control comprising:  
humidifier having an electrical input power and capable of humidifying said gas up to

a level of humidity prior to delivery to said patient, said level of humidity depending on said input power to said humidifier,

means for determining a parameter relating to the flow rate of said gas through said apparatus;

means for determining based on at least said parameter the required electrical power input to said humidifier to deliver said gas to said patient at a level of humidity or at a temperature substantially similar to said desired level of humidity or said desired temperature;

BB means for supplying as said input power to said humidifier a level of power substantially similar to said determined power input to said humidifier;

means for continuously monitoring said parameter , and when a change in said parameter is greater than a first threshold, indicating a change in the flow rate of said gas, the flow rate is determined again.

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